A204.1 General

1. SWM facilities shall be designed to regulate the 2 and 10 year storm such that the post-developed peak flows do not exceed pre-development peak flow and safely pass the 100 year storm event.

2. SWM and BMP facilities shall not be located in required buffer areas unless authorized by the Zoning Administrator.

3. All SWM/BMP ponds must be constructed prior to 70% completion (based on performance guarantee) of the approved project. When ponds are used as temporary sediment controls, the facility must be converted once 90% permanent stabilization has been established as defined in Section 208 of this Manual.

4. Every stormwater treatment practice shall consider acceptable forms of water quality pretreatment. The applicability of pretreatment will be at the discretion of the review agent.

5. All wet facilities shall have an aquatic bench at least 10' wide with slopes not to exceed 1:10 (V:H) slope or 1' water depth.

6. No facility shall have slopes and/or embankments steeper than 3:1 (H:V) without prior approval of the Program Administrator.

7. No more than 1 penetration shall be allowed through a dam structure without prior approval of the Program Administrator.

8. Stormwater management facilities may be either above grade or below grade design, however, underground facilities shall only be permitted within non-residential areas.

9. Principal outlet control structures shall be RCP unless prior approval is obtained by the approval authority.

10. No combined primary and emergency spillway will be allowed without prior approval by the Program Administrator.

11. Unless otherwise approved by the director, all ponds, wet and dry, must provide for a gravity low flow drain and no BMP storage credit is allowed for computed volume that is below the low flow drain elevation.

12. All SWM facility routing shall have design frequency storms start at the "BMP full elevation." Meaning that no water quality storage volume credit is allowed when routing for quantity control.

13. The 100-year storm must be analyzed through the emergency spillway only with the principal riser structure clogged. In the event of no emergency spillway, the 100-year analysis must assume 50% clogging of the controlling outlet component and start at the top of riser elevation unless otherwise approved by the Director.

14. Vegetated Overland Emergency Spillways shall not be designed to be activated for any storm frequency less than the 100-year storm event.

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15. For all Subdivision Plans, the maximum computed 100-year water surface elevation must be contained within the Stormwater Management Parcel. For all Site Plans, the maximum computed 100-year water surface elevation must be contained within a Stormwater Management Parcel or Easement.

16. All SWM/BMP Facilities shall be designed for the total contributing drainage area.

A204.2 Water Quality

1. Pollution loads shall be determined by calculation methods set forth in the Northern Virginia BMP Handbook. Where required, BMP facilities shall be designed to reduce projected phosphorus runoff resulting from site development by at least forty percent (40%). Phosphorus removal efficiencies for the different types of BMP systems are established in the Northern Virginia BMP Handbook and the Virginia SWM Handbook. Where a method or facility without an efficiency rating is proposed, the designer shall be required to adequately substantiate the ratings before the design is approved

2. If a site is less than 20,000 square feet of disturbed area and no structural stormwater management is required, the phosphorus removal requirement shall be 15%.

3. A minimum separation of 50’ shall be provided between drainfields and SWM/BMP facilities, except wet ponds. A minimum separation of 100' shall be provided between drainfields and wet ponds.

A204.2.2 BMP Design Worksheet

Adapted from Northern Virginia BMP Handbook. See said handbook for further explanation.

The basic requirements for a BMP plan submission in Fauquier County are listed below. The designer should check with Fauquier County for specific plan submission requirements.

1) A brief narrative summarizing how water quality control requirements are being provided for the site.

2) A map showing all subareas used in the computation of weighted average “C” factors, BMP storage, and phosphorus removal including offsite areas, open space, and uncontrolled areas.

3) Open space used for BMP credit should be delineated on the plan sheets with the note: “Water quality management area. BMP credit allowed for open space. No use or disturbance of this area is permitted without the express written permission of Fauquier County.”

4) Open space used for BMP credit can only be floodplain or jurisdictional wetlands and should be placed in a conservation easement with metes and bounds shown on plat.

5) Computations used to determine BMP outflow rates and size outlet structures.

6) Computation of BMP facility storage requirements.

7) Computation of BMP phosphorus removal for the site.

8) Computation of BMP site coverage.

9) A statement of maintenance responsibility for each BMP (public or private) should be stated on the plans.

Additional information may be required by the director of the plan review agency to justify the use of privately maintained nonstandard designs or in unusual circumstances.

This section presents the calculations required for the overall design of a BMP system for a site. It focuses on the calculations required to show compliance with the water quality requirements and general facility design parameters related to these requirements. Procedures for computing phosphorus removal and determining storage volume, site coverage requirements, and orifice size requirements are included. Stormwater quantity considerations are addressed in general terms. The reader must note that the considerations detailed in this section do not address stormwater quantity management requirements unless specifically noted. Specific requirements regarding BMP facilities may apply for individual jurisdictions and the reader should check with the appropriate review agency accordingly.

The most effective control of all is to reduce the generation of pollutants at the source. This is best accomplished by setting aside areas of land in a natural and undisturbed state and preserving it from future development and/or activities which would generate pollutants, such as the application of herbicides and pesticides. Qualifying open space can be either forested or natural meadow and must be placed in floodplain or conservation easements without overlying encumbrances. For example, utility easements within floodplains cannot be considered qualifying open space because land disturbance and vegetation growth control may occur as the result of maintenance activities within the easement. Under normal circumstances, conservation and floodplain easements on private residential lots do not qualify as open space because the easement requirements for conservation of natural vegetation are not enforceable from a practical standpoint. It should be noted that in some instances, best practical design dictates that significant natural undisturbed areas may occur on land that local jurisdictions may find unenforceable from an easement standpoint. These areas, which may include large tree save areas on private lots, may be considered on a case by case basis by the regulatory agency as qualifying open space. Additionally, land areas that are creatively engineered to reclaim land to a natural state such as wetland mitigation areas may be given consideration as a qualifying open space. Qualifying open space is treated as a land use credit rather than a control. Check with local review agency for specific requirements and credits allowed for open space.

1. Water Quality Narrative

All BMP facility designers will be required to submit a Water Quality Narrative to the appropriate reviewing agency. The water quality control narrative consists of a brief description of what the requirements are, how they will be met, and what type(s) of controls will be used. Although it is presented first in the design format, it is generally written after all design computations are completed.

The narrative will include the following information where applicable:

- What the water quality control requirements are (e.g. 50% phosphorus removal, water quality inlets, etc.); what areas of the site are subject to the requirements; and, what creates the requirement (e.g. Water Supply Overlay District, Resource

Management Area, Resource Protection Area, proffered condition, or special permit condition).

- The number and types of structural BMPs used.
- Use of qualifying open space for BMP credit.
- Offsite areas which are being controlled.
- Contributions to the construction of regional BMPs.
- Interim water quality control requirements and BMPs for sites with permanent BMP facilities to be built in the future.
- Waivers, deferrals, or approved modifications to normal design criteria related to the BMPs.
- Maintenance responsibility for the BMPs (public or private).
- Any related agreements with offsite property owners.

The BMP facility designer should consult with the appropriate reviewing agency for any additional items which may be required in the water quality narrative.

2. Watershed Information

Part 1 List all the Subareas and "C" Factors used in the BMP Computations

Subarea Designation and Description (1)	"C" (2)	Acres (3)

List all of the subareas with their associated "C" factors that are to be used in the BMP design computations. These subareas and "C" factors will also be shown on an accompanying map.

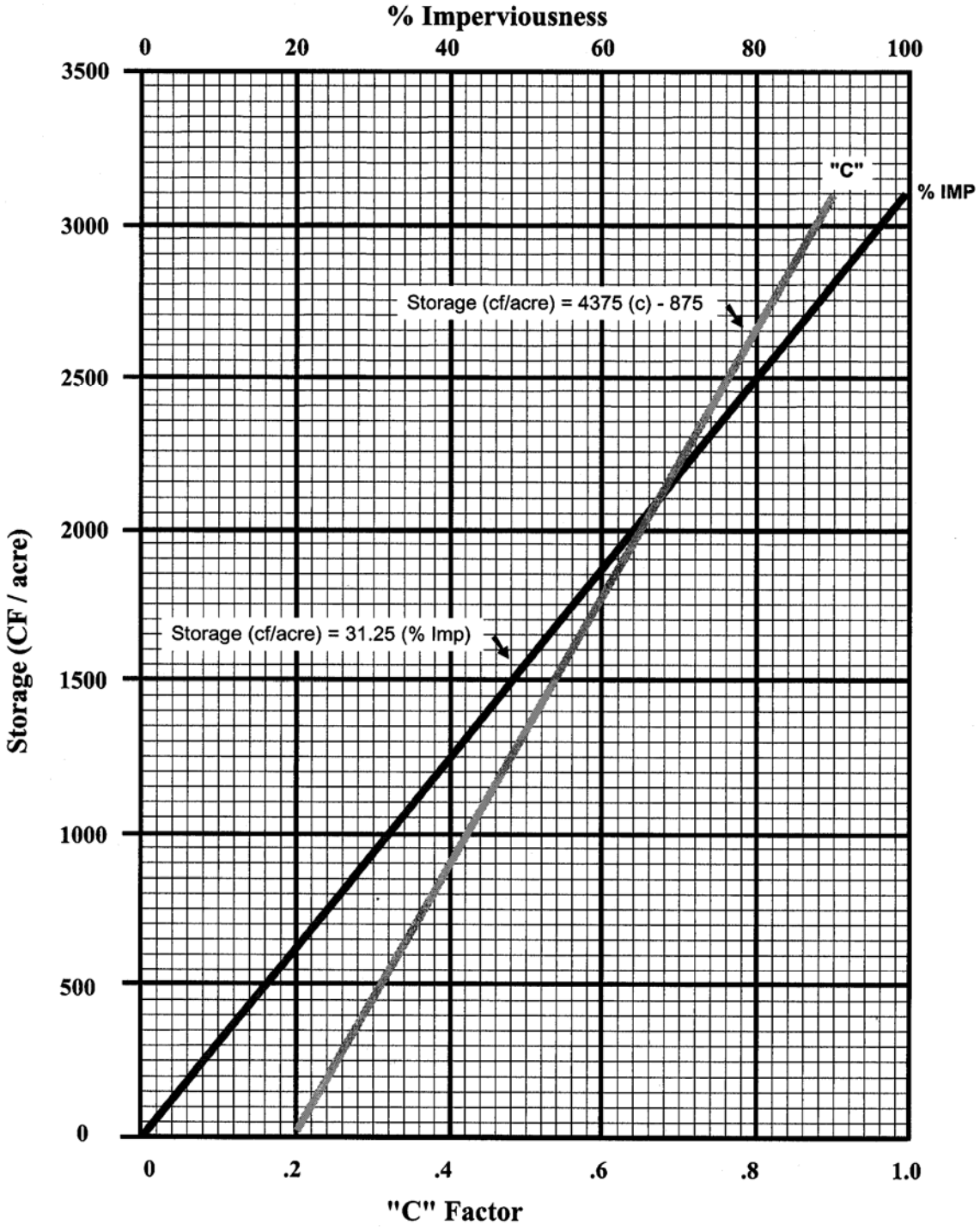
- In developing the subareas to be used in the design computations, remember that the purpose is to be able to compute weighted average "C" factors for the site and for each proposed BMP facility, and to perform the phosphorus removal computations. At a minimum, you will need one subarea for each BMP utilized, including open space, and

for all uncontrolled onsite areas. If offsite areas are being controlled, they should be listed as separate subareas.

- In order to determine the required number of subareas, first select a suitable map base and overlay the drainage divides based on the final site grading and locations of proposed and existing structural BMP controls. The map base should cover all of the areas draining through the site. Next, further divide these areas by overlaying the proposed land use. For offsite areas, always assume the maximum density possible. This would correspond to the greatest of the existing density, existing zoning, or planned land use from the comprehensive plan. If only a portion of the site is subject to water quality controls, delineate those areas on the map. Finally show on this map all of the open space qualifying for BMP credit. This procedure should yield all of the subareas needed to perform the BMP computations. Remember, in preparing the list of subareas, list each subarea only once. A short description of each subarea included with the list will aid in the review of the plan (e.g. "A1 onsite uncontrolled" or "B3 onsite open space" or "C2 onsite controlled to Pond 2").

- Rational formula "C" factors are to be selected from the general zoning values listed in section A203.2.2.C. The percent imperviousness can be substituted for the rational formula "C" factor directly in the design of extended detention facilities and infiltration facilities. If % imperviousness is used and "C" factors are needed to compute storage requirements, the designer should estimate "C" factors from the % imperviousness, soil type, and slope. For the purposes of computing BMP storage only, the relationship between % imperviousness and rational formula "C" factor can be expressed as : ("C" = 0.00714 x %imp. + 0.20). [This formula was derived from Fairfax County PFM Chart A6-40 and is not to be used in performing other types of hydrologic computations. Refer to below].

CHART "A"



Water Quality Storage Requirements Related to Percent Imperviousness and Rational Formula "C" Factor

(Equivalent to Fairfax County Public Facilities Manual, Chart A6-40, 1988)

Source: **Northern Virginia BMP Handbook**

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- If the offsite property is undeveloped or developed without controls, use 0.20 x the area of the property draining to the facility. The site coverage requirement of 80% implies that a maximum of 20% of the undeveloped or redeveloped offsite property will be uncontrolled. Whenever these areas appear in computations, they should be preceded by the multiplier of 0.20 in parentheses and the area reduction performed as part of the computation so that there is no confusion regarding whether or not the area reduction has been performed. For example, in the watershed data listing in this section, the offsite area should be shown as:

Subarea Designation and Description	"C"	Acres
(1)	(2)	(3)
B3 Offsite Undeveloped	0.65	(0.20) 46.5

  Or when computing the weighted average "C" factor in Part 7 the area would be shown as:

Subarea Designation	"C"		Acres		Product
(1)	(2)		(3)		(4)
B3 Offsite Undeveloped	0.65	x	(0.20) 46.5	=	6.045

- If the offsite property has BMPs, use the actual uncontrolled offsite area draining to the proposed facility.

- Under some circumstances, full credit may be allowed for control of offsite areas which are undeveloped or developed without BMPs provided there is sufficient reason to believe that they cannot be practically controlled by other means. In these instances, the 0.20 multiplier would not be used. Two examples of these kinds of areas are existing highways and areas too small to be controlled by individual facilities.

3. Phosphorus Removal – General

For those designing BMP facilities within Northern Virginia, it is necessary to calculate the phosphorus removal capability of the proposed system. Phosphorus removal in Northern Virginia will be calculated differently depending on the particular local jurisdiction in which the BMp facility is to be built. The method presented in section 3a is referred to as the "Occoquan Method" and was developed by Fairfax County.

BMP phosphorus removal efficiencies are the same for Northern Virginia jurisdictions unless otherwise noted. The table below presents the accepted removal efficiencies for BMPs in Northern Virginia.

Phosphorus Removal Efficiencies for Different BMP Facilities	
Facility Type	**Removal Rate**
Extended Detention Dry Pond	
Design (i) (Chart "A")	40%
Regional	50%*
Wet Pond	
Design (i) (4.0 x Vr)	50%
Design (ii) (2.5 x Vr + Extended Detention)	45%
Regional (4.0 x Vr)	65%*

Phosphorus Removal Efficiencies for Different BMP Facilities	
Facility Type	
Infiltration Trench	**Removal Rate**
Design (i) (0.5 in/imp. ac.)	
Design (ii) (1.0 in/imp. ac.)	50%
Design (iii) (2-year 2-hour storm)	65%
	70%

* Note: Phosphorus removal credit and specific requirements for the establishment of regional ponds may vary between jurisdictions. The designer should contact the appropriate agency before consideration of such a facility.

Phosphorus removal efficiencies can be increased as shown in the previous table for regional stormwater management (SWM) facilities that meet the following criteria:

- The regional SWM facility is part of a watershed-wide SWM plan which considers environmentally sensitive features and minimizes negative impacts on them. The locality may permit onsite SWM facilities to be considered as regional facilities, if the drainage area served and controlled by the facility is approximately 100 acres or greater.

- The design of the regional SWM facility may include sediment forebays and aquatic benches, if applicable.

- The entire drainage area is used in determining BMP volume and phosphorus removal requirements.

3a. Phosphorus Removal – "Occoquan Method"

The following general principles have been used in developing the worksheets provided in this section for the computation of phosphorus removal.

1. A minimum of 80% of the site should be served by a combination of structural and nonstructural controls.

2. Offsite land use must always by assumed to be at ultimate density.

3. Both extended detention dry pond and wet pond pollutant removal rates fall off rapidly as storage capacity is reduced below the design storage. In order to achieve the listed pollutant removal efficiency, proposed BMP facilities should provide storage for all of the uncontrolled areas flowing into them.

4. Credit for control of offsite areas which do not provide their own controls is allowed. If the offsite areas are undeveloped or may be redeveloped, it is assumed that 80% site coverage will be provided and only 20% of the offsite area will be controlled for credit. Under some circumstances, full credit may be allowed for control of offsite areas which are undeveloped or developed without BMPs provided there is reason to believe that they can not be practically controlled by other means.

5. The phosphorus removal credit achieved by each facility is proportional to the "C" factor and the land area served by that facility.

Part 2 Computed the Weighted Average "C" Factor for the Site

The weighted average "C" factor (Rational Formula) is computed for the area of the site subject to BMP requirements.

(A) Area of the Site (a)_____acres

Enter the area of the site in the space marked (a)_____. This establishes the base area for which BMP requirements are to be satisfied.

- For multi-phase projects, a single BMP computation can be performed for the entire development and the combined area of all phases entered here (optional).
- If you are providing coverage for an adjoining development through a legal agreement, include the combined area of both developments here as if it was a single project with two phases.
- If you are claiming full or partial credit for control of an offsite area, do not include the offsite area here.

(B) Subarea Designation (1)	"C" (2)		Acres (3)		Product (4)
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
			(b) Total	=	_____

Select the subareas of the site corresponding to the above from the list in Part 1 and enter the information in the appropriate columns. The product of the "C" factors and the corresponding areas is computed, totaled and entered in the space marked (b) _____.

- At this stage, the site need only be divided into the number of subareas necessary to account for variations in land use which would cause differences in "C" factors. However, the need to superimpose the drainage divides based on the final site grading and BMP locations will create additional subareas.

(C) Weighted average "C" factor (b) / (a) = (c)_____

The weighted average "C" factor is computed by dividing Line 2(b) by Line 2(a) and entering the results in the space marked (c)_____.

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Part 3 Compute the Total Phosphorus Removal for the Site.

Subarea Designation	BMP Type	Removal Eff. (%)		Area Ratio		"C" Factor Ratio		Product
(1)	(2)	(3)		(4)		(5)		(6)
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
			X		X		=	
						(a) Total	=	%

Column (1): List all of the subareas of the site, as defined in Part 2, here; and any additional offsite areas which are being controlled.

4. Site Coverage

Part 5 Determine Compliance with Site Coverage Requirement

Sum all the uncontrolled onsite areas and compute a weighted average "C" factor. Do not include qualifying open space.

Subarea Designation	"C"		Acres		Product
(1)	(2)		(3)		(4)
		X		=	
		X		=	
		X		=	
		X		=	
		X		=	
(A) Total equivalent uncontrolled area			(a) Total	=	

List all of the uncontrolled onsite areas and their associated "C" factors. Do not include qualifying open space. The product of the "C" factors and their corresponding areas is computed, totaled and entered in the space marked (a)_____.

(B) Total uncontrolled area (b)_____

Enter the total uncontrolled area (sum of the areas in column 3) in the space marked 5(b)_____.

(C) Weighted average "C" factor (a) / (b) = (c)_____

The weighted average "C" factor is computed by dividing Line 5(a) by Line 5(b) and entering the quotient in the space marked (c)_____.

(D) If line 5(b) <20% of Line 2(a) , then the site coverage requirement is satisfied. Line 5(a) is the equivalent offsite area for which coverage may be required.

100 x Line 5(b)_____ / Line 2(a)_____ = (d)_____%

Divide the uncontrolled area of the site, Line 5(b), by the total area of the site from Line 2(a); multiply by 100 and enter in the space marked (d)_____. If this value is less than 20%, then the site coverage requirement is satisfied.

Part 6 Determine the Offsite Areas for which Coverage is Required

(A) For the offsite areas listed in Part 1 which flow to proposed onsite BMPs compute the equivalent areas.

Subarea Designation	"C"		Acres		Product
(1)	(2)		(3)		(4)
		X		=	
		X		=	
		X		=	
		X		=	
		X		=	
		X		=	
		X		=	
		X		=	
		X		=	
			(a) Total	=	

For the offsite areas listed, which are not considered part of the base site area listed in Part 2(B), compute the equivalent onsite areas based on the "C" factor of the offsite area. The product of the "C" factors and the corresponding areas is computed, totaled and entered in the space marked (a)_____.

- If the equivalent offsite area, Line 6(a), draining to all proposed BMP facilities is greater than the equivalent uncontrolled area of the site shown in Line 5(a); then the offsite area controlled by the proposed BMP facilities may be reduced untilthe two area equal. Otherwise, all uncontrolled offsite areas draining to the proposed BMP facilities must be included. All offsite areas thus reduced should be marked with an "*" wherever they appear in the computations.

5. Storage Volume

Part 7 Compute the Weighted Average "C" Factor for each Proposed BMP Facility

The weighted average "C" factor (Rational Formula) is computed for the total area to be controlled by the proposed BMP facility. This step should be repeated for each proposed facility.

(A) List the areas to be controlled by the proposed BMP.

Subarea Designation (1)	"C" (2)		Acres (3)		Product (4)
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
			(a)	=	_____

Enter the total of the onsite and offsite areas (including qualifying open space) to be controlled by the proposed BMP facility in the space marked (a)_____.

- The drainage area to the proposed BMP facility should be divided into the number of subareas necessary to account for variations in land use which would cause differencies in "C" factors and between onsite and offsite areas.

- The onsite area controlled by the proposed facility normally includes all the area draining to that facility except for areas which are to be controlled by other proposed or existing facilities. Qualifying open space is to be included even though it does not contribute materially to the storage requirement.

- The offsite area controlled by the proposed facility should include all of the uncontrolled offsite area draining to that facility. When storage is not provided for the uncontrolled offsite water draining through a facility, the facility will be hydraulically overloaded and not function at its design efficiency. In order to address this issue, some control of offsite areas will be required for all sites which do not achieve 100% site coverage if their facilities are located such that offsite water flows through them. An upper limit (see Part 5) has been placed on the extent of the offsite areas for which control will be required. However, controls may be provided for as much of the uncontrolled offsite area draining through each facility as desired in order to obtain additional phosphorus removal credit.

- Under some circumstances, full credit may be allowed for control of offsite areas which area undeveloped or developed without BMPs provided there is sufficient reason to believe that they cannot be practically controlled by other means. Two examples of these kinds of areas are existing highways and areas too small to be controlled by individual facilities.

- "C" factors for undeveloped offsite areas should be based on ultimate "build-out" conditions.

(B) (b) _____

Compute the product of the "C" factors and the areas and enter in column (4). Total the products and list in the space marked (b)_____.

(C) Weighted average "C" factor (b) / (a) = (c)

The weighted average "C" factor is computed by dividing Line 7(b) by Line 7(a) and entering the quotient into the space marked (c)_____.

Part 8 Determine the Storage Required for each Proposed Facility

(A) Extended Detention Dry Pond

Chart "A" value (see page 61 of this section) for BMP storage per acre
[(4375 x "C") – 875] or [31.25 x %imp.] = (a)_____cf / ac

- Design 1 (48 hour drawdown)
  Line 7(a)_____ x Line 8(a)_____ = _____cf

Determine the BMP storage volume required per acre for extended detention using Chart "A" on page 61 of this section or either of the formulas provided and enter in the space marked (a).

Multiply the area to be controlled, Line 7(a), by the BMP storage per acre, Line 8(a) to compute the required storage.

- Chart "A" (Fairfax County PFM Chart A6-40) was derived from the results of a study performed by NVPDC (1979). The "Storage-Treatment" model developed by NVPDC was used to investigate potential detention basin design modifications. The purpose of the investigation was to determine storage volumes which would allow improved sedimentation of runoff from minor to moderate storm events. A range of rainfall depths over a variety of land uses was used in the model and compared to the amount and size of sediment particles that could settle out. The results of the study, shown in Chart "A", reflect the fact that areas of lower imperviousness should store runoff from a small storm (0.1 inch) while areas of higher imperviousness should store runoff from a more intense storm (0.78 inch) in order to achieve the same pollutant removal rates. For more information, the reader is referred to the Guidebook for Screening Urban Non-Point Pollution Management Strategies (NVPDC, 1979).

(B) Wet Pond

Volume of runoff per acre from mean storm.
[1452 x "C"] = 1452 x Line 7(c) = (b)_____ cf/ac

- Design 1 (2.5 x Volume of runoff from mean storm event in wet storage with extended detention above the permanent pool)
  Wet Storage
  2.5 x Line 7(a)_____ x Line 8(b)_____ = _____cf
  Extended Detention
  Line 7(a)_____ x Line 8(a)_____ = _____cf

- Design 2 (4.0 x Volume of runoff from mean storm)
  4.0 x Line 7(a)_____ x Line 8(b)_____ = _____cf

Determine the volume of runoff from the mean storm from the formula provided using the "C" factor and enter in the space marked (b)_____.

Multiply the area to be controlled, Line 7(a), by the BMP storage per acre, Line 8(b) to compute the required storage.

- The formula is based on an average annual rainfall of 40.0 inches per year and an average of 100 storms per year. The expanded formula would be [(40.0in/100) / (12in/ft) x (43,560 sf/ac) x area].

(C) Infiltration Trench

- Design 1 (0.50 inch per impervious acre)
  0.50 x 36.30 x (%imp.)_____ x Line 7(a)_____ = _____ cf

- Design 2 (1.0 inch per impervious acre)
  1.0 x 36.30 x (%imp.)_____ x Line 7(a)_____ = _____cf.

- Design 3 (2-year 2-hour storm)
  (2.0/12) x 43,560 x "C"_____ x Line 7(a)_____ = _____cf

Enter the % imp. (e.g. 20% not 0.20) or "C" factor as appropriate and the area to be controlled, Line 7 (a), and perform the indicated multiplication to compute the required storage.

6. Outlet Computation

Part 9 Determine the Required Orifice Size for Each Extended Detention Facility

The orifice size for extended detention storage is computed using the standard orifice equation with a 48 hour drawdown time from the full pool BMP volume and an orifice coefficient of 0.60. The BMP (extended detention) volume and the maximum head at the BMP volume are the only information required to perform the computation.

(A) BMP storage requirement (S) from Part 8. (a)_____

The extended detention volume from line 8(a)_____ is entered in the space marked (a)_____.

- Please note that the volume to be placed here is the required BMP volume not the BMP volume actually provided. If the BMP volume provided is greater than the volume required and the orifice size is computed on that basis, the result will be inadequate detention times on smaller storms because of too large an orifice.

(B) Maximum Head (h) at the required BMP storage from the elevation-storage curve for the facility. (b)_____

Enter maximum head (h) at the required BMP storage from the elevation-storage curve for the facility.

- Measure the head from the BMP water surface elevation to the centroid of the orifice not the invert of the orifice.

(C) Peak outflow rate (Q_p) at the maximum head for a drawdown time of 48 hrs [$Q_p = S / (0.5 \times 3600 \times 48)$].

0.0000116 x Line 9(a)_____ = (c)_____

Compute the peak outflow rate (Q_p) at the maximum head for a drawdown time of 48 hours from the BMP volume in line 9(a)_____ and enter in the space marked (c)_____.

(D) Required orifice area (A) [$A = Q_p / (0.6 \times (64.4 \times h)^{o.5})$]
Line 9(c)_____ / [0.6 x (64.4 x Line 9(b)_____)$^{o.5}$]] = (d)_____

Compute the required orifice area from the peak outflow rate and the maximum head and enter in the space marked (d)_____.

(E) Diameter of a circular orifice.
2.0 x (Line 9(d)_____ / 3.1415927)$^{o.5}$ = (e)_____

Compute the diameter of a circular orifice from the required orifice area and enter in the space marked (e)_____.